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Global and China Hybrid Electric Vehicle Research Report, 2022

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Hybrid Research: China Hybrid EV penetration rate will hit 22% within five years

With the development of automobile energy-saving and new energy technologies and the promotion of low-carbon emission reduction policies worldwide, fuel economy and low-carbon emissions have been in the spotlight of automobile development, and hybrid electric vehicles have become R&D focus of current automobile industry.

The commercialization of hybrid vehicles has been developing for more than 20 years, with four major markets in the world: Europe, the United States, Japan, and China, which differ in technology, strategy and marketplace. Different automakers are also diversifying their hybrid system architectures. At present, hybrid technologies vary with technology platforms.

Hybrid vehicles are accelerating the pace of replacing fuel vehicles in China

According to statistics, 6.495 million new energy passenger cars (EVs+PHEVs) were sold globally in 2021, up 107.9% year-on-year with the market share hitting a record as high as 9%; wherein, the sales volume of battery-electric passenger cars (EVs) swelled by 69% year-on-year to 4.6 million units, and the sales volume of plug-in hybrid electric passenger cars (PHEVs) increased by 31% year-on-year to approximately 1.9 million units. In 2021, the global sales volume of energy-efficient HEVs jumped by more than 20% year-on-year to approximately 3.5 million units.

Catalyzed by a series of policies such as emission regulations, Measures for the Parallel Management of Corporate Average Fuel Consumption (CAFC) and New Energy Vehicle (NEV) Credits of Passenger Car Companies, Energy-saving and New Energy Vehicle Technology Roadmap 2.0, energy-saving and new energy vehicles are burgeoning. Low fuel consumption and Measures for the Parallel Management of Corporate Average Fuel Consumption (CAFC) and New Energy Vehicle (NEV) Credits of Passenger Car Companies have prompted automakers to accelerate the transformation toward electrification and speed up the deployment of 48V, HEV, REEV, PHEV and other hybrid roadmaps.

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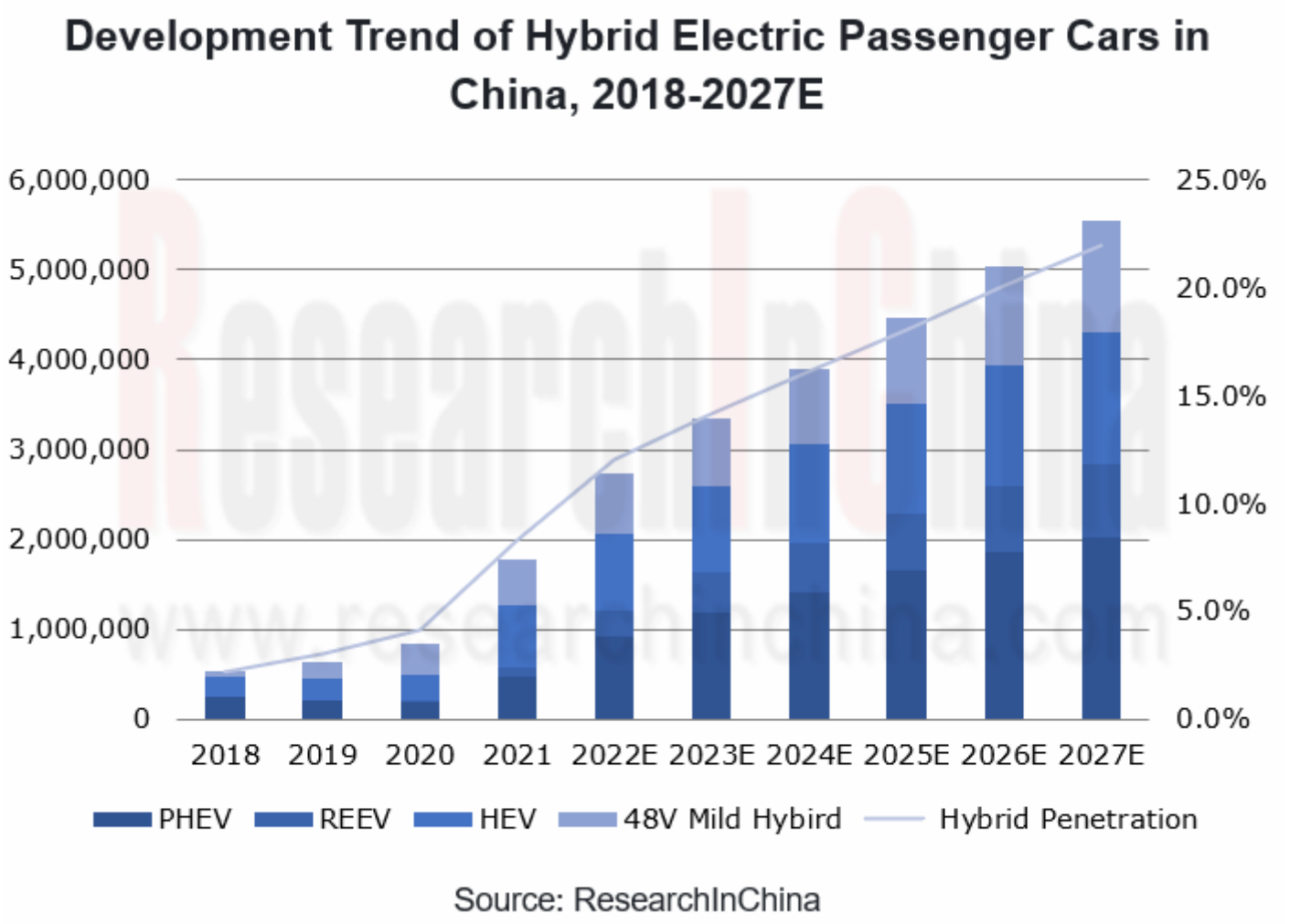
In 2021, the sales volume of hybrid passenger cars in China reached 1.778 million units, including 470,000 PHEVs, 105,000 REEVs, 689,000 HEVs, and 513,000 48V mild hybrids. With the development of hybrid systems of Chinese independent brands, PHEVs will outsell HEVs and 48V mild hybrids by 2022. REEVs have performed well since the launch, and will still grow at a relatively high growth rate from 2022 to 2027.

The penetration rate of hybrid electric passenger cars in China will fetched 8.3% in 2021, and it is expected to hit 22% by 2027 with sales over 5.5 million units.



Independent Automakers' Hybrid Technology Development

After several years of development, Chinese independent brand automakers have made significant progress in hybrid vehicle technology, even surpassed Japanese companies such as Toyota and Honda in some aspects of performance. Their models cover weak hybrids, mild hybrids/medium hybrids, strong hybrids and so on:

Micro Hybrid - Start / Stop (12V): The currently available start / stop 12V passenger car models mainly come from European and American brands, while Chinese independent brands account for 19% of the total models;

Mild/Medium Hybrid (48V): Although Chinese independent brand automakers have deployed 48V mild hybrid system technology, they offer few models, and almost only FAW-Hongqi, Geely and Great Wall have sold cars equipped with the technology.

PHEV: BYD DM, DM-i, Great Wall L.E.M.O.N DHT, Geely Thor Hybrid Hi·X, Changan Blue Whale iDD and other hybrid systems have been mass-produced. BYD DM and DM-i have been installed on many of its models; DHT, has been applied to Mocha, Latte, Macchiato and other models of Great Wall; Changan Blue Whale iDD has been applied to UNI-K, UNI-V models;

REEV: The REEVs currently for sale mainly include Seres SF5, AITO M5, Li ONE and Voyah FREE. In June 2022, Li Auto released a full-size SUV - Li L9, and AITO unveiled a medium and large range-extended SUV - AITO M7. Both were so appealing that they received over 20,000 orders upon launch.

Performance Comparison of Mass-produced Models by Hybrid Platform Architecture

Brand	Hybrid System	Model	Class	NEDC EV Range (KM)	Comprehensive Fuel Consumption (L/100km)	Power/Fuel Consumption at the Lowest Load (L/100km)
BYD	DM-i	BYD QinPLUS DM-i	CAR-A	55-120	0.7-1.2(NEDC)	3.8
	DM-i	BYD Song	SUV-A	51-110	0.9-1.5(NEDC)	4.4-5.2
	DM-i	BYD Destroyer 05	CAR-A	55-120	1.58-2.17(WLTC)	4.6
	DM-i	BYD Song MAX	MPV-A	51-105	2.01-2.87(WLTC)	5.3-5.4
	DM-p/DM-i	BYD Tang	SUV-B	112-252	1.89-2.56(WLTC)	5.5-7.5
	DM-p/DM-i	BYD Han DM	CAR-C	121-242	1.71(WLTC)	4.2-5.2
	DM-p/DM-i	BYD QinPro	CAR-A	53-82	1-1.4(NEDC)	4.3
Great Wall Motor	L.E.M.O.N. DHT	Great Wall WEY Macchiato	SUV-A	110	0.8(NEDC)	4.4
	L.E.M.O.N. DHT	Great Wall Mocha	SUV-B	175-204(WLTC)	0.45-0.73(WLTC)	5.55-6.3
Geely	Hi-X	Emgrand L Hi-X	CAR-A	100	-	3.8
Changan	Blue Whale iDD	Changan UNI-K	SUV-B	130	0.8(NEDC)	5
	Blue Whale iDD	Changan UNI-V	CAR-A	-	1.59(WLTC)	-
Chery	Kunpeng DHT	Tiggo 8 PLUS Kunpeng e+	SUV-B	100	1(NEDC)	5

Source: ResearchInChina

OEMs have mass-produced a new generation of DHE + DHT + integrated electric drive hybrid architecture

From the perspective of technical route selection:

- 48V hybrid technology maintains steady growth by continuously improving motor efficiency and electrification level. At this stage, it is mainly driven by foreign OEMs;
- HEV technology-based models pay more attention to development of energy saving, cost reduction, system simplification, etc.;
- PHEV technology is developing towards low energy consumption and high cost performance, and China has explored an independent development of PHEV technology path;
- REEV technology is complementary to other hybrid technologies due to its simple structure. High battery life and driving experience are welcomed by consumers. Driven by star models such as Li, AITO, and Voyah, it will grow rapidly in the next few years.

From the perspective of hybrid technology platform layout of OEMs, domestic OEMs have independently developed DHE (hybrid special engine) + DHT (hybrid special transmission assembly), and the platform supports multiple hybrid architectures such as HEV, PHEV, and REEV at the same time:

Hybrid Platform Architecture of Some OEMs

Automaker	Hybrid Platform	Description
BYD	BYD DM-i Super Hybrid	After three iterations of DM technology, BYD launched the DM-i hybrid system. The electric hybrid system (EHS), the core of the DM-i Super Hybrid, adopts the P1+P3 series-parallel form, and consists of three assemblies: EHS132, EHS145 and EHS160. It is suitable for all A- to C-class models.
长城汽车 Great Wall	Great Wall L.E.M.O.N. DHT Hybrid Platform	Great Wall Motor introduced three sets of powertrain solutions, i.e., 1.5L+DHT100, 1.5T+DHT130 and 1.5T+DHT130+P4 (three-motor four-drive powertrain), which are compatible with both HEV and PHEV solutions. HYCET Technology, an arm of Great Wall Motor, independently developed dedicated hybrid transmission (DHT) and dedicated hybrid engine (DHE).
吉利汽车 GEELY AUTO	Geely Hi-X Hybrid	It includes two dedicated hybrid engines, DHE15 (1.5T) and DHE20 (2.0T), and two dedicated hybrid transmissions, DHT (1st gear) and DHT Pro (3rd gear). It allows full coverage of A0 to C-class models and covers multiple hybrid technologies, e.g., HEV, PHEV and REEV.
Chery	Chery Kunpeng DHT Super Hybrid	The technology route is Kunpeng Dedicated Hybrid Transmission (DHT) based on dual-motor drive architecture. It helps to bypass the technical barriers of the power split route and create the world's first full-featured hybrid configuration Kunpeng DHT. In 2022, it is mass-produced and mounted on the New Tiggo 8 PLUS.
长安汽车 CHANGAN	Changan Blue Whale iDD Hybrid System	The advanced multi-mode electric drive system designed by Changan Automobile is composed of four major components: Dedicated Hybrid Engine, Blue Whale Electric Drive Transmission, Large Capacity Battery and Intelligent Control System. It has more than 400 independent components. The Blue Whale Electric Drive Transmission features 4 core technologies: three-clutch integration, high-efficiency high-pressure hydraulic system, intelligent electronic dual-pump, and S-winding.
广汽传祺	GAC Trumpchi 2.0T+THS Hybrid System	The hybrid models will pack the third-generation 2.0T engine independently developed by GAC, the Toyota THS dual-engine power system, and E-CVT.
TOYOTA	Toyota Hybrid System (THS)	Toyota's hybrid technology has been developed to the fifth generation. The fifth generation THS enables the front motor output of up to 70kW/185Nm, and a 15% reduction in weight. It uses ultra-low viscosity oil and is configured with the E-FOUR electric four-wheel drive for the first time. New models, e.g., Toyota Noah/Vaux use the TNGA GA-C platform E-FOUR.
HONDA	Honda i-MMD System	The Honda i-MMD system has been upgraded to the third generation, and tends to be efficient and miniaturized as well. The third-generation Honda i-MMD adopts the motor/generator coaxial layout, with the core components including 2.0L naturally aspirated engine, drive/generator dual motor, intelligent power unit (IPU).

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